Flat Rolling Process -A Review

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Abstract -*In Era of manufacturing at large scale, Rolling is much efficient to give high production of desired shapes by investing less on process. Rolling Process can specify as process to decrease cross section of Metal Stocks (Slab, Billet, Bloom).Rolling process one can divide into two section that is Flat and The Shape Rolling. In Flat Rolling generally Slab is used . During Process is carrying out continuously due to some reason like Temperature , Roll Design and etc. Defect like Wavy Edge, edge Crack is occur on Manufactured Product. By Study the cause behind defect is identified then after with Techology and by some experimental or numerical method once is able to overcome the problem related to process. Till Reserch is going on the Rolling For more accurating process and for to eliminate the cause by which defect is occur on products*

***Key Words*: Era , Slab , Billets , Bloom, Wavy edges, Edge Crack , Defects.**

1. INTRODUCTION

In Metalworking or Metalforming Process. Rolling is process existing from hundreds of years ago. To Complete Rolling Process rolling mill plays crusios role. And with help of compressive force this process is carried out . Early this is found before 600 BCA in middle east and south asia but it is in rough form which is associated with rolling principle. The first rolling mill design is find in Europeans dates 1485 is attribute from drawing of Leonardo da Vinci, he describe " making pass between rollers " . The very first roll were hand driven an small used by artist and jewellers to soften metal .

Day by day, advancement is seen operating mills by power . This transformation of power as per history transferred from four phase i.e Manual, Hydraulic, steam power and last Electric power.

First Phase was Manual during this mill is hand driven then after some duration crank is joined to mill for Rolling.Limitation for this it able to rolls only soft metals.

Second phase hydraulic power in this roll is driven by harnessing the energy of moving water from river it is enough to roll harden metals . Limitation for this is drought and environmental issues.

Third Phase in this rolling mill operate on steam power by steam engines. In Fourth phase rolling mills used electric power. Since electric power was conventional transmitted from remote generator to motors directly attached to mills

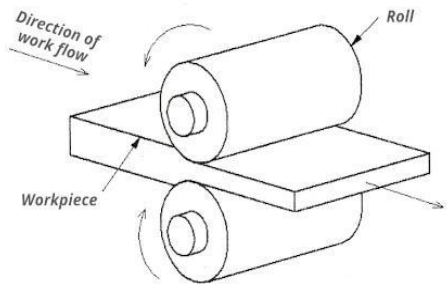
Modern rolling practice can be attributed to pioneering efforts of Henry Cork. Rolling mills used electric power appeared in a 1900 and its remains choice of operator todays.

2. Literature Review

Serial Number	Title of Paper	Author and Year of Publication
1 .	Process modelling of flat rolling of steel	Faisal Jamal, Sushant Rajput, Bappa Acherjee,2018
2	Numerical modelling rolling control process, elastic deformation	Mesay alema, Tolcha And Holm, Altenberk,2019
3.	Experimental and Numerical study of low carbon steel cold flat rolling	Ibtesam Mohie Manee, Abdul Kareem Flaih Haseen,2020
4.	Improving quality in process of hot rolling steel sheet.	Kelones Turisova, Tomas villinsky,2021
5.	A comprehensive review on increment deformation in rolling process.	Prajwal Agrawal, Sangeet Aggarwal, Alexander Pesin,2022

3. Flat Rolling Process.

Most basic form of Rolling in which workpiece (slab) having first and last cross section same that is rectangle work on principle of compression exerted by rollers on Slab.



Stocks is passed between rollers gap due to compressive force slab result in making final product. Sometime due to some improper knowledge, roller design, temperature defects are occur on sheet,plates and coils

4. Finding-

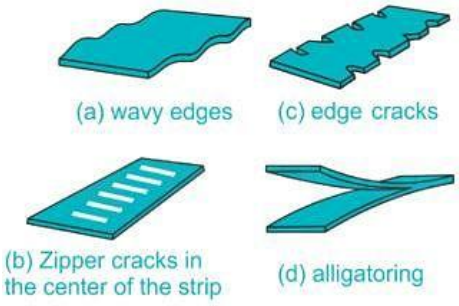
Deflection in rollers occur when rolling process in progress due to different forces exerted on materials causes defects. This may be surface rolling or internal structural type of rolling defect .Some of rolling defect commonly find in process are

Wavy edges- This defect result in thicker in middle part of final products occurs due to imperfection of the rollers sometimes due to compressive loading

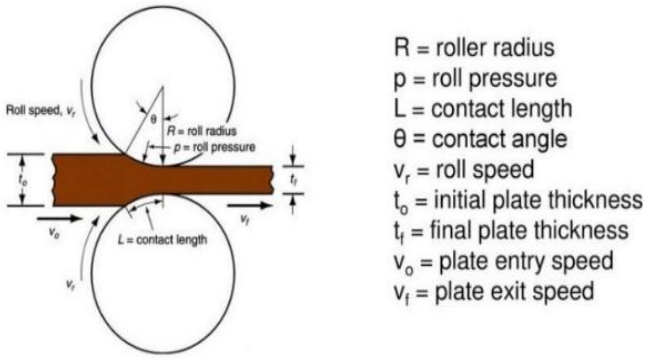
Zipper Cracks – This defects is seen in Centre of sheets occurs due to uneven stress distribution of strips

Edge Crack – Occurs when hot rollers is cooled down and quenching is taken placed on strips

Alligating Cracks - Occurs due to weakness of metallurgy is there ,cracks separate the layer and the opening in final end.



5. Flat Rolling Process Terminology.



The slab enters the space between the Roller at a velocity Vo, and exits at a velocity Vf. Because the volume flow rate is kept constant and the thickness is decrease, Vf. Should be big r than Vo. The roller surface velocity Vr, is larger than Vo, and small than Vf. This means that slipping occurs between the slab and the Roller only at one point along the contact length, there is no slipping (relative motion) between the slab and the roll this called no slip points

6. Analysis for Flat Rolling.

a.. The contact length decreases by decrease in the roll radius.

b. The force depends on the contact length, and hence, reducing the roll radius will reduce the roll force.

$$L = \sqrt{R}\,(To - Tf)$$

c. The torque and power depend on the roll force and contact length, and therefore, reducing the roll radius will decreased both the torque and power

In flat rolling torque and power is analysed by

$T = 0.5\ F\ L$ where F – Roller force, L – Cont. Length

d The power also depends on the rotational speed of the rolls, and therefore, reducing the rolls RPM will reduce the power

Power required is the product of torque and angular velocity

Angular velocity = 2N

P=2πNFL/2 (πNFL for each roll). Total P= 2 πNFL.

So, Power(in KW) = 2πFLN/60000, where force is in N,, length in meter and revolutions are per minute.

(hp)= 2πFLN/33000 where force is in pounds, length is in feets.

7. Conclusion-

In this review we makes an analysis of flat rolling process we studied it to overcome the problems or defects occurs in Rolling process due to its rollers design. We reviews one to understand the consideration while rollers to be design.

BIOGRAPHIES

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